# Effect of Shot Size on Peening Intensity for Local Peening of Different Thickness Samples

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## Introduction

The time of peening a surface is decided by selecting a specified arc height from saturation curves obtained by peening standard Almen strips. Saturation curves are obtained by plotting arc heights against the time of peening while peening parameters such as pressure of air, stand off, shot size and material and type and shape of nozzle are maintained unchanged. The time of saturation is defined as the time required to produce a specified arc height at which doubling of time of peening will not increase the arc height by more than 10%. However, the saturation curve must be obtained by peening the curve uniformly. This is explained in Fig 1 where curve 1 is for uniform peening. During an earlier investigation [1] on 90 mm long, 1.0 mm thick strips it was found that the shape of the saturation curve for locally peened specimens was different than that for uniformly peened specimens. In Fig 1 curve 2 is for locally peened samples and while the curve 2 is different than curve 1 the time of saturation determined from 1 would not correspond to local peening condition and infact will be an overestimate. It was also shown [1] that as the shot size increases it becomes difficult to estimate the time of

saturation because the curve begins to droop much earlier and definition of time of saturation may not be satisfied.

In the present work further experimental work on different thickness samples which were locally shot peened is reported.

Experimental Work

Samples of carbon steel (0.12%C,0.03%Si,1.5% Mn, 0.04% S and P - E long 25%, UTS 46 kg/mm$^2$, Hardness 27 $R_A$) were shot peened in pneumatic shot peening equipment with the syphonic action nozzle shown in Fig.2. The peening parameters in all cases were as follows:

Nozzle - 60 CC/sec air discharge with throat dia. of 7.0 mm and outlet dia. of 13.0 mm
Stand off - 23 mm
Tank pressure - 6.0 Kg/cm$^2$
Shot - S-330

The arc height in each case was measured by an LVDT displacement gauge provided with a digital readout.

Fig.4 describes the saturation curves for samples that were 1.0,1.4,1.63 and 2.0 mm thick respectively. It is observed that for thicknesses of 1.0 and 1.4 for carbon steel the nature of the curve for local peening is same as already reported [1] and shown in Fig.1. But for thicknesses of 1.63 and 2.0 mm the saturation curves are very much same as the standard saturation curves for uniform peening. To see if these effects were due to the material being non-standard, standard Almen strips of thicknesses .8 mm and 1.3 mm having hardnesses between 45-50 $R_C$ were given local peening treatment. The results are shown plotted in Fig.3. It is observed that the local peening has resulted in drooping of saturation curves in case of standard Almen strips also. The higher hardness of standard Almen strips has caused initial linear portion to shift towards left and lesser maximum arc height.

Discussion

Apparently the coverage in a locally peened sample tends to extend equally on either side of the centre as the time of peening increases. The local peening however, creates non uniform condition with greater intensity concentrated in the central region. In thinner strips the errosion of material surface becomes visible corresponding to begining of drooping. This means that drooping is caused by local overpeening of the central region. In thicker carbon steel specimens surface errosion did not appear and consequently no drooping occured.

It is evident from the results that saturation curves from uniform peening will overestimate the saturation time for local peening even if drooping is not observed because the initial linear region is shifted to the right in the latter case as well.

Reference

[1] M.C.Sharma and Abdul Mubeen
Journal of Mechanical Working Technology
8 (1983) 155-160.

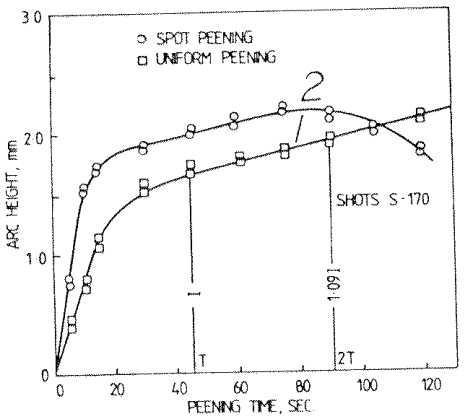


Fig.1 Saturation curves for Carbon Steel. [1]

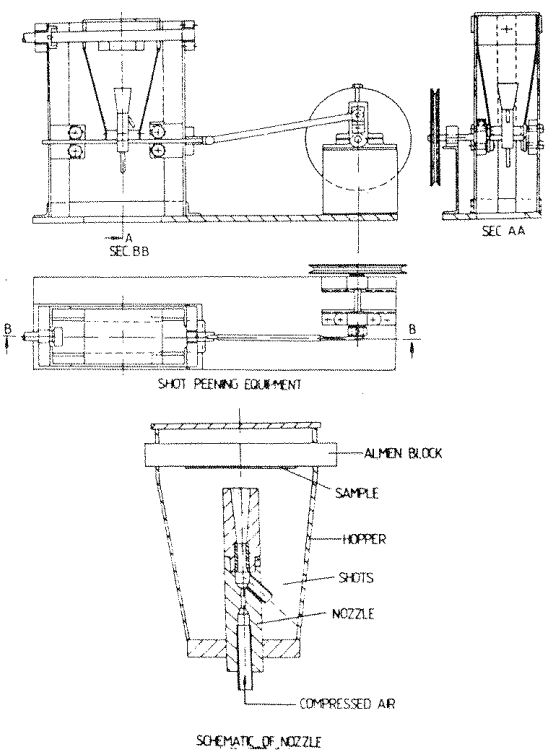


Fig.2 Shot Peening Equipment.

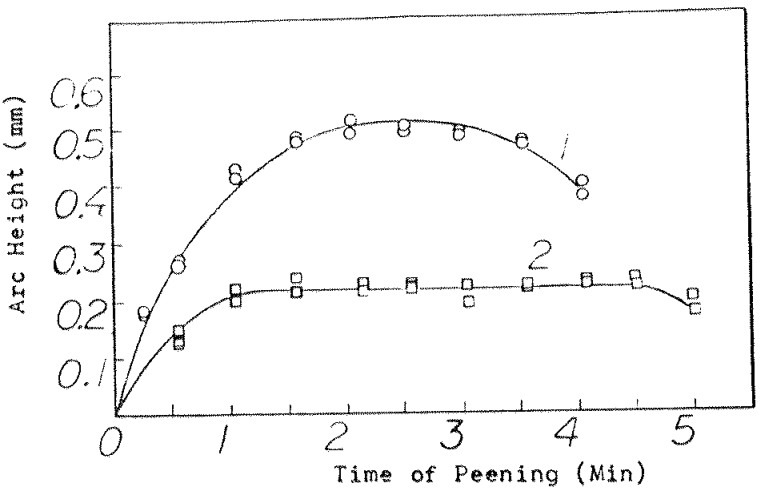


Fig.3 Saturation Curves for Standard Almen Strips 1-.8mm thick, 2-1.3mm thick. Conditions of Peening described in the text.

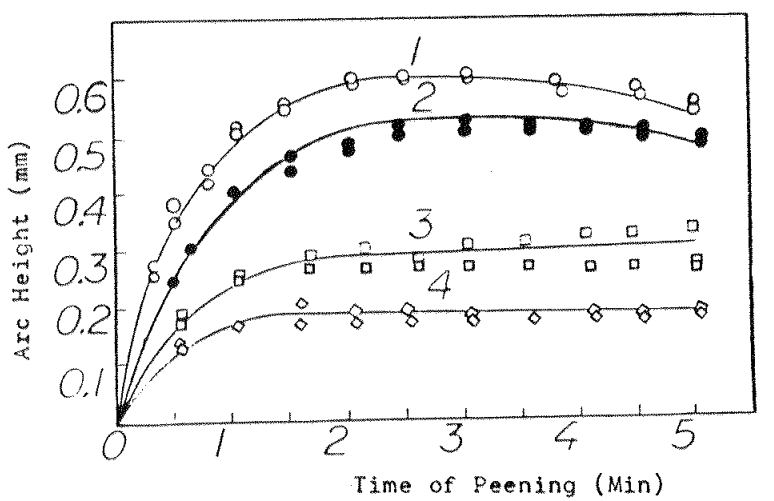


Fig.4 Saturation Curves for C-Steel sample of Standard Gauge length under conditions described in the text. 1-1.0 mm thick, 2-1.4 mm thick 3-1.63 mm thick, 4-2.0mm thick.